ABSTRACT

Design charts have been developed for the economical design of sprinkler system. The two design charts - (i) for lateral line (ii) for submain and main line have been constructed by and plotting the equations of system capacity, number of laterals, Reynolds number, friction factor of Darcy-Weisbach formula, head loss due to friction, head gain or loss due to elevation difference, pressure variation in the pipe line and inlet pressure heads of the pipe line nomographically in combination with family of curves of relative roughness height of pipe wall, ratio of the first sprinkler spacing from the inlet of the lateral line to the full sprinkler spacing and the first lateral at full or half lateral spacing from the inlet of submain or main line. With the help of the design chart for lateral line, the design alternatives for a given field data would be obtained for all the data sets (which fulfill the need of particular application rate) taken from the manufacturer's sprinklers performance chart. The minimum cost diameter of the lateral line for each data set would be determined by performing the cost analysis. Similarly, with the help of the design chart of submain and main line and cost analysis, the minimum cost diameter of the submain (if required) to operate the lateral line of the minimum cost diameter, and the minimum cost diameter of the main line to operate the submain or lateral of the minimum cost diameter would

(xxi)

be obtained for each data set taken from the sprinklers performance chart. To perform the cost analysis of the lateral. submain and main line, a third desigh chart has also been constructed by plotting the equations of the initial fixed and' operating costs and their total nomographically in combination with the family of curves of the capital recovery factor and escalating energy cost factor. By comparing the total of the minimum costs of lateral, submain and main lines for each data set of sprinklers performance chart and using the concept of cost effectiveness, the economical sprinkler system would be selected. After selecting the economical system, the annual costs of the lateral, submain and main lines would be obtained from the design charts. The design charts are also applicable to design the minimum cost diameters and the annual costs of the two pipe sizes lateral and main line in split-line operation. The computer program have also been developed to test the reliability of the design charts and use as the design methods.

KEY WORDS

Sprinkler Performance ChartFriction FactorLife Cycle Cost AnalysisCost EscalationAnnual CostNomographyComputer Program in FORTRANLateral LineSubmain LineMain LineMain Line in Split-line Operation

Multiple Outlet Pipe Friction Reduction Coefficient

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